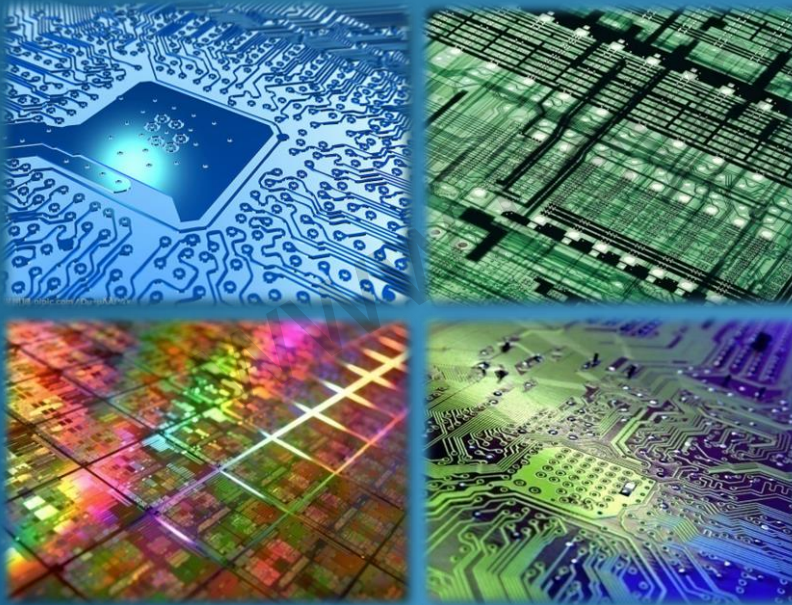


E-tools solution -Introduction and Comparison



Ce//Wise

Agenda

- General Introduction
- Solutions Insight
- CW1055 Introduction and Comparison

Li-Ion battery for E-tools

- Higher energy density than Ni-Cd, Ni-MH
- Longer cycle loop
- More environmentally friendly

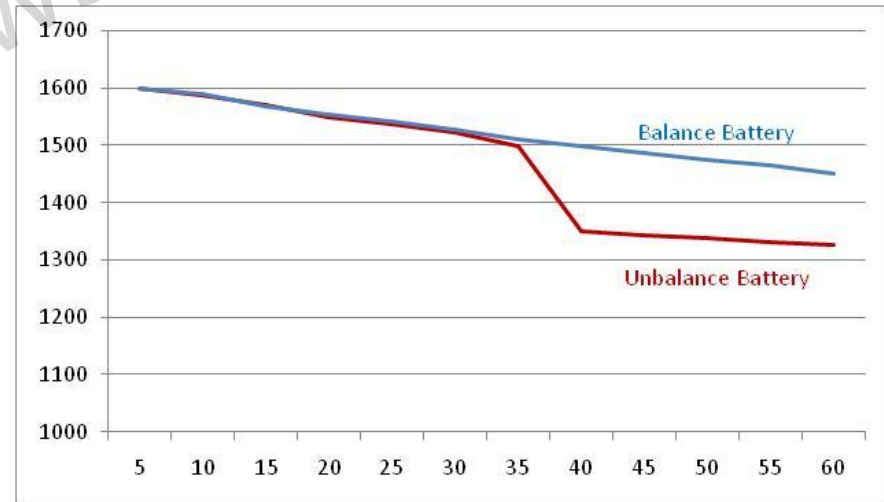


Challenge for Li-ion battery

- More active, more dangerous
- Balance require when used in series
- Special require in E-tools application



Exploded



Common Solution and Require

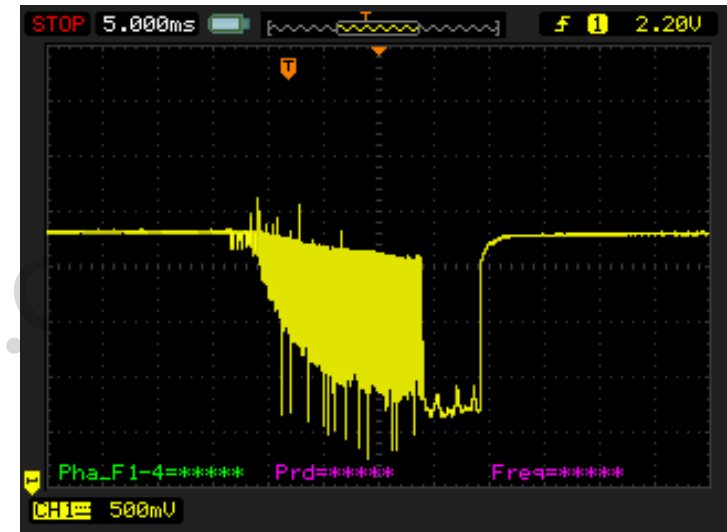
- Battery Protection for Safety
 - Voltage protection
 - Current protection
 - Temperature protection
- Battery Pack Management for Performance or Cost
 - NMOS Drive
 - Balance
 - Etc.

Are normal protection ICs meet your application?

- Traditional protections are design for NB market
 - PMOS Driver
 - No NTC temperature protection
 - No Balance
 - No Excess-current Auto recover
 - No Battery Capacity Indicator...

Is MCU solution suitable for your design?

- AFE+MCU scheme
 - Flexible
- Disadvantage
 - Easily to be interfered
 - Higher power dissipation
 - More expensive
 - Complex design

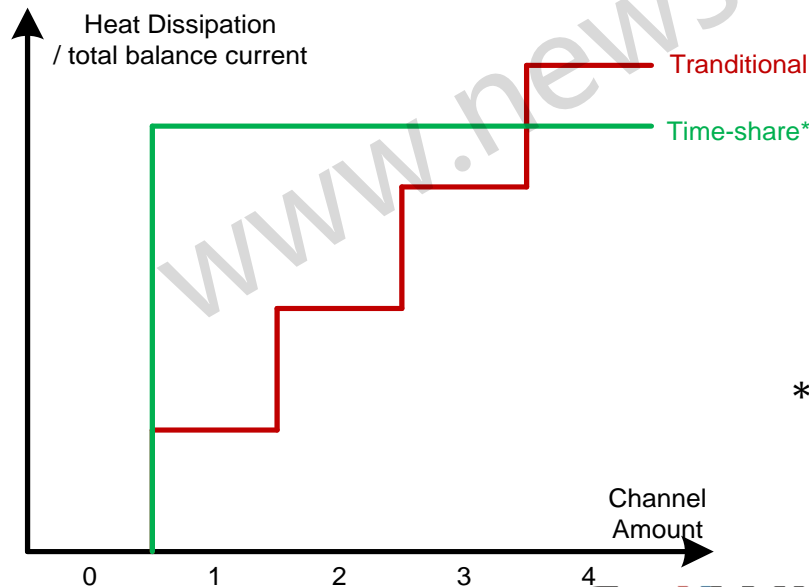


Compare with other protection IC

	Seiko	Seiko	Mitsumi	O2	CW	
Type	S8205	S8254	MM3474	OZ8920	CW1055	CW1043
Cell Amount	5	4	5	8	5	4
Protection method	Hardware	Hardware	Hardware	Software	Hardware	Hardware
Active PD	20uA	12uA	10uA	590uA	20uA	20uA
Sleep PD	0.1uA	0.1uA	3uA	38uA	0.1uA	0.1uA
Voltage	28V	28V	30V	48V	30V	30V
OV accuracy	±25mV	±25mV	±25mV	±10mV	±20mV	±20mV
OD accuracy	±80mV	±80mV	±80mV	±10mV	±80mV	±80mV
EC1 accuracy	±15mV	±15mV	±15mV	±1mV	±10mV	±10mV
Temp protection	NO or PTC	NO	NO or PTC	NTC	NTC	NTC
Balance	NO	NO	NO	YES	YES	YES
SOC LED	NO	NO	NO	NO	YES	NO
Pre Charge	NO	NO	NO	YES	YES	YES
Auto-recover after Excess current	NO	NO	NO	Adaptable	YES	YES
Application	Simple	Simple	Simple	Very complex	Simple	Simple
Price	\$0.8~1	\$0.4~0.6	\$0.6~0.8	\$1~1.5	\$0.6~0.8	\$0.4~0.6

Patented Time Share Balance

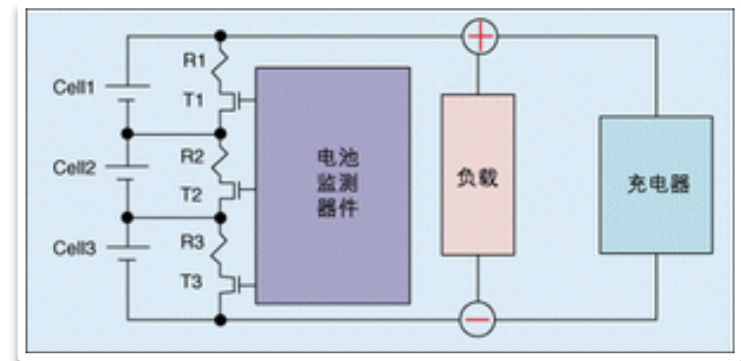
- 10ms per channel
 - Continue to balance if only one channel
- Optimize space heat dissipation
- Average increase about 40% balance efficiency*



*Determined by the actual PCB layout

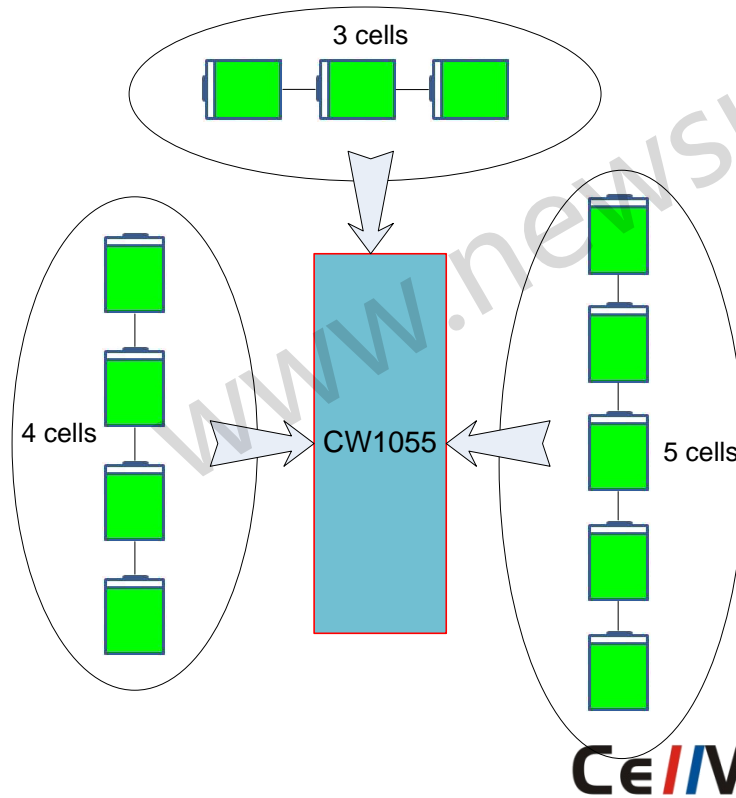
How to ensure the cell uniformity?

- High performance battery cell
 - Cell from foreign country
 - Expensive
- National battery cell with balance function
 - Passive balance is enough
 - Lower cost, same performance
 - Cost
 - About \$0.047 per channel
 - Save cell cost, about \$1 per channel



3~5 Cells Adaptable

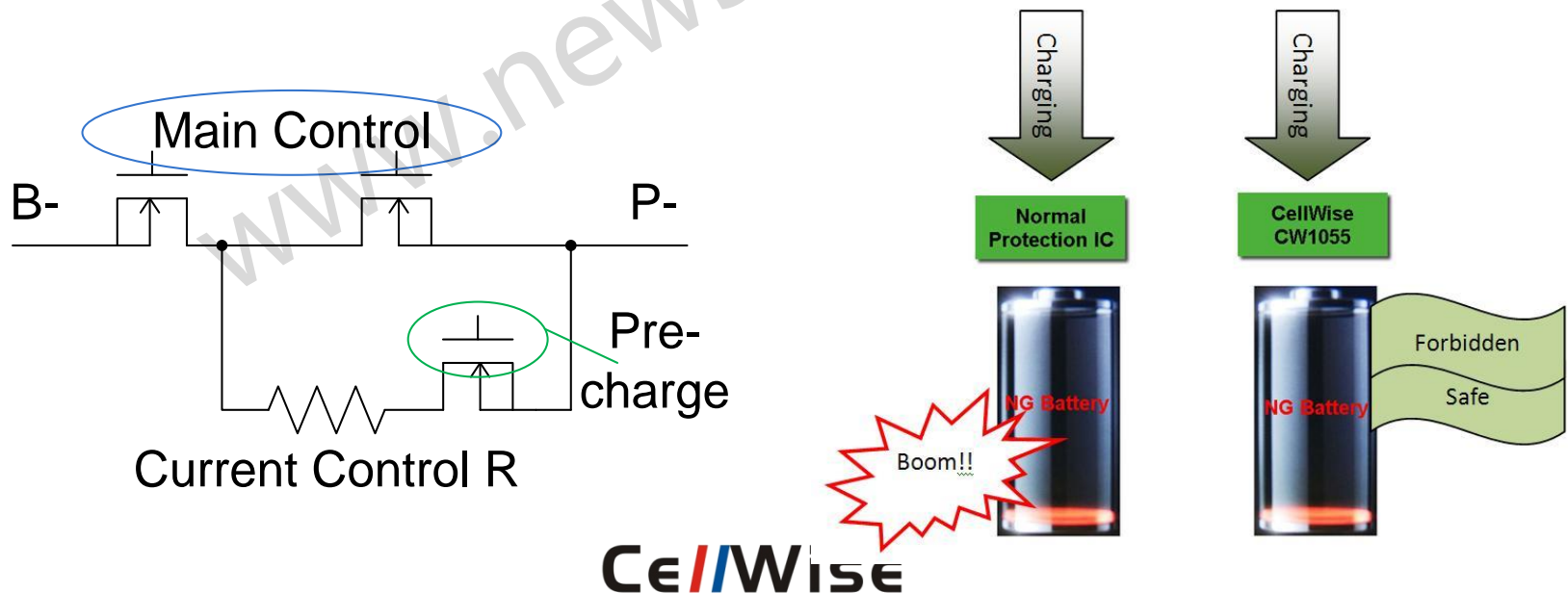
- External pin for choosing 3, 4 or 5 cells
 - Two pins: SEL2 and SEL1
 - 00 for 3 cell, 01 for 4 cell, 1x for 5cell



- Just one IC
 - Similar design
 - Reduce developing and verifying workload
 - Reduce storage risk

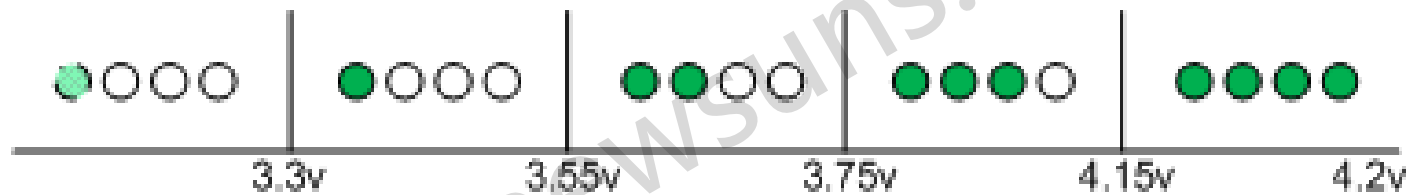
Pre-charge identify NG pack

- Pre charge when low voltage
 - Current set by the external resistor
- Waiting then judge battery voltage
 - Stop charging and discharging if NG



LED Display

- 4 LEDs driver indicates the remaining capacity
- 4 Voltage Compare Threshold

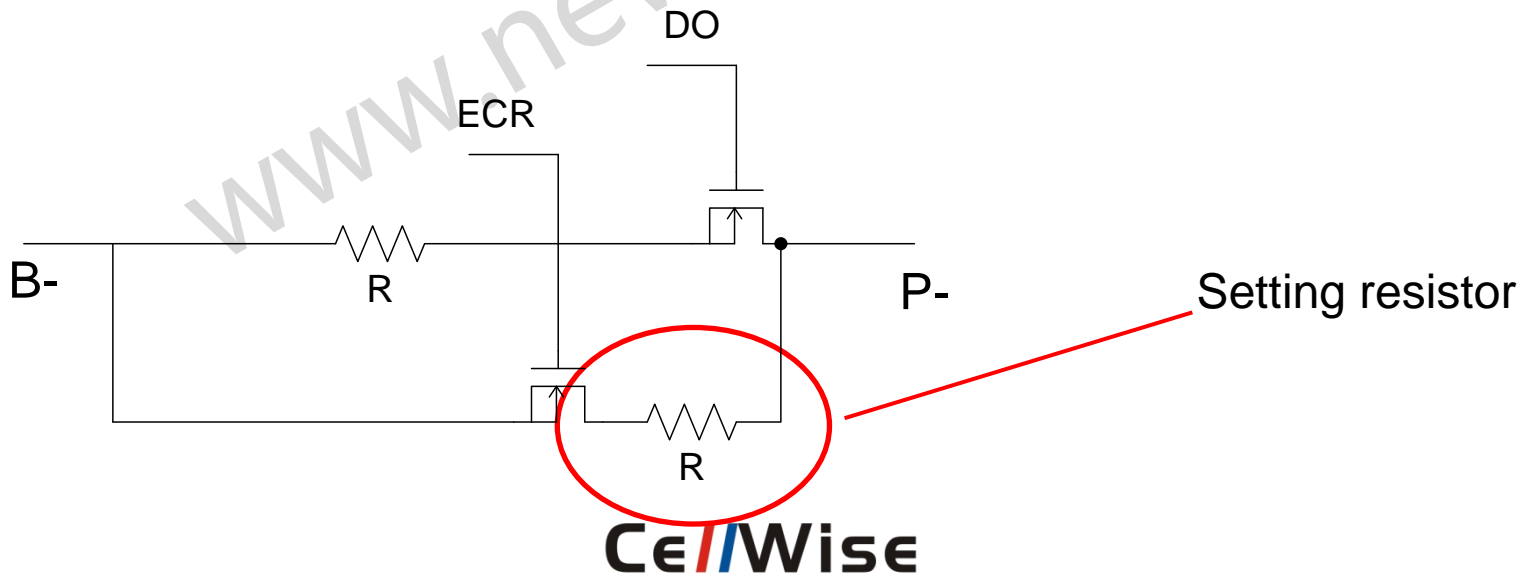


- Switch control display
 - Maintains 2s



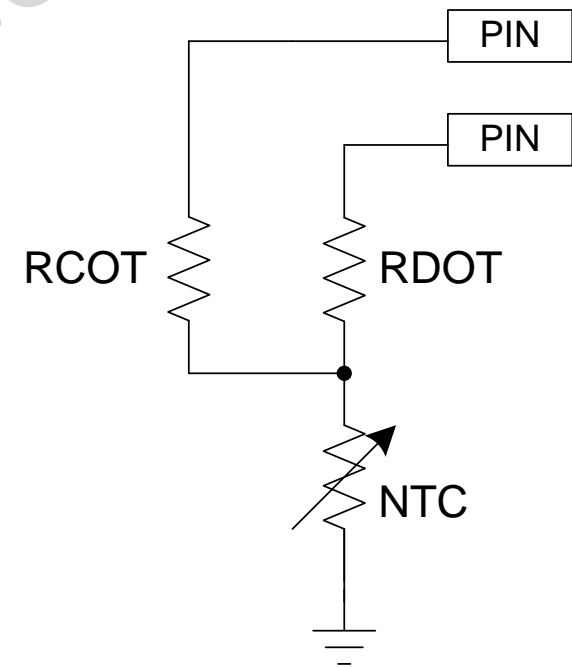
Auto recover after excess-current

- Auto recover after excess-current release
 - Cut off discharging MOS when EC
 - Resistor to set the auto recover current
 - 500ohm resistor, about 18mA recover current



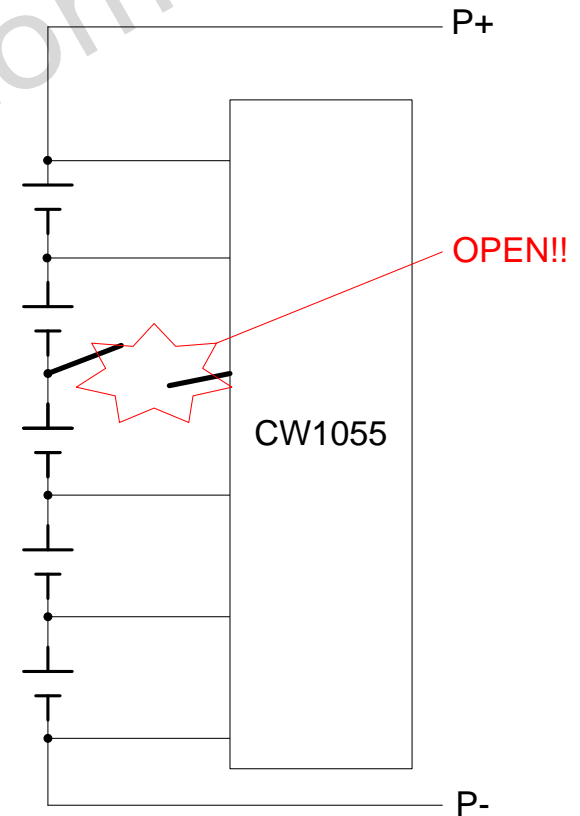
Temperature Protection

- Over temperature protection
 - Charging over temperature
 - Discharging over temperature
- Different threshold, one NTC
 - Save design, save cost

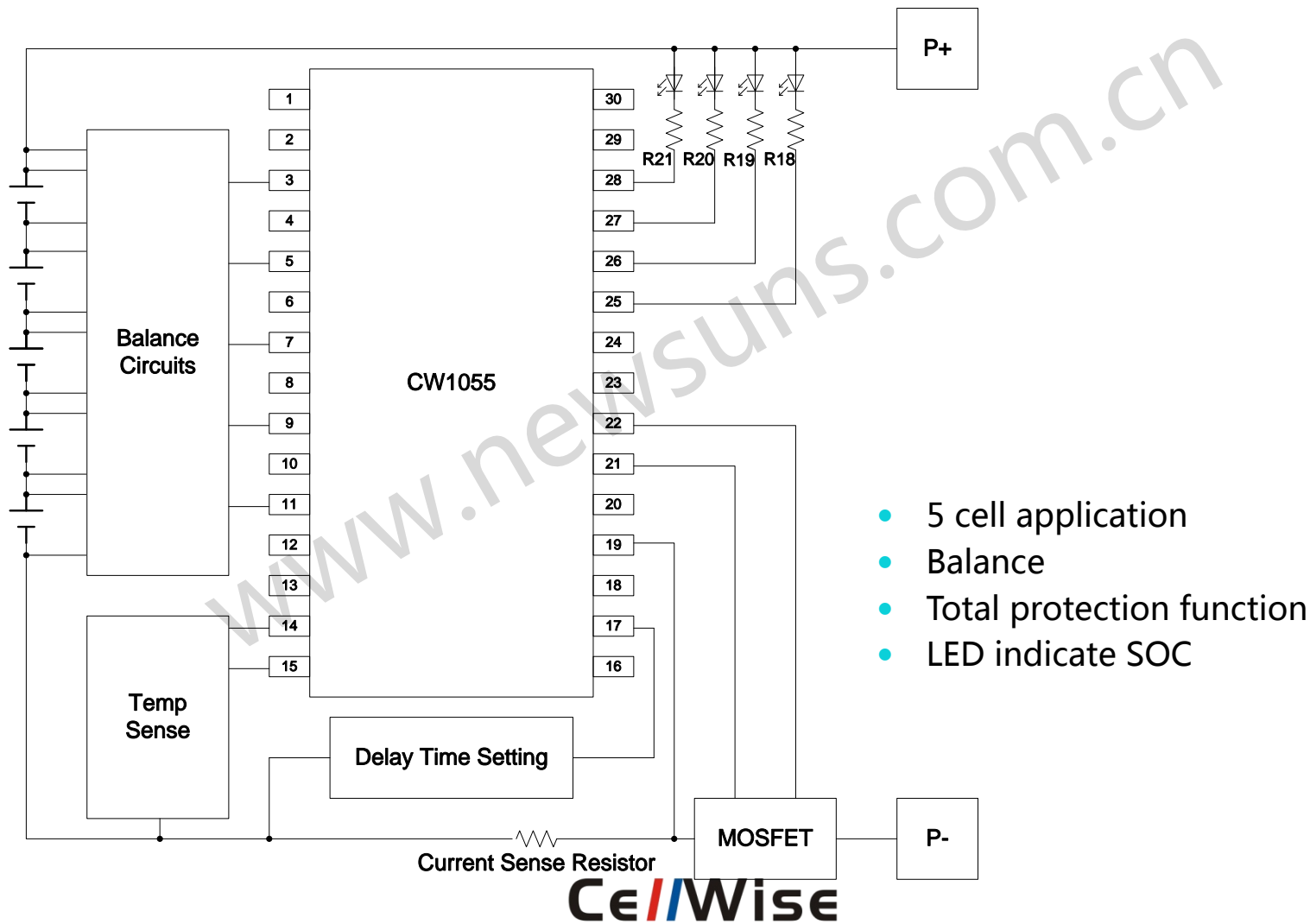


Open-wire detection

- IC disconnected from battery pack
 - Any cell disconnected
 - Stop charging and discharging
 - Device lock



Compact design, higher performance



Thanks!

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